Length-Weight Relationships of Five Species of the Family Sparidae in the Gulf of Guinea

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Abstract

Length-weight relationships are presented by sex and by country for five species of the family Sparidae sampled in April 1990 during the *Guinea '90* trawling survey off Sierra Leone, Liberia, Côte d'Ivoire and Ghana.

Introduction

The *Guinea '90* demersal trawl survey, carried out from 1 to 30 April 1990 covered the coastal waters off Sierra Leone, Liberia, Côte d'Ivoire and Ghana (Fig. 1) and involved researchers from these four countries, and from Spain. The main objectives of this survey was to estimate the biomass of the offshore demersal species in the region. Twenty-seven transects and 167 stations at depths ranging from 20 m to 700 m were covered. The results of this trawl survey are summarized in Ramos et al. (1990).

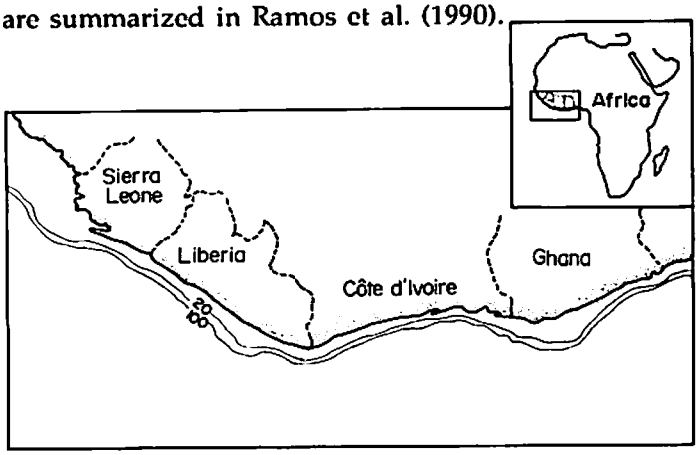

Fig. 1. ***Area of West Africa covered by the* Guinea '90 *trawl survey.***

This paper analyzes length-weight data collected during that cruise on five fish species of the family Sparidae, i.e., *Pagrus caeruleostictus, Pagellus bellottii, Dentex canariensis, D. congoensis* and *D. angolensis*. Sparids comprise a major component of the demersal fish resources along the coast of the four countries surveyed, both in terms of their abundance and their commercial value.

Materials and Methods

Fork length (in cm) and weight of each individual fish were measured and the sex subsequently determined. The length-weight relationship used here is a function of the form:

$$W = a \cdot L^b \qquad ...1)$$

where W refers to the weight and L to the length of the individual; the L-W data pairs are analyzed by ordinary least squares regression, using a log-transformed version of equation (1), viz

$$\log_{10} W = \log_{10} a + b \cdot \log_{10} L \qquad ...2)$$

The systematic bias introduced by the logarithmic transformation was corrected using the correction factor C suggested by Sprugel (1983):

$$C = \exp((2.303 \cdot S_{(y)})^2/2) \qquad ...3)$$

where $S_{(y)}$ is the standard error of a "y-estimate", i.e., of a predicted value log W, and 2.303 the natural logarithm of ten.

The analysis was done separately for females, males and for the combined samples, to which unsexed juveniles were added (hereafter referred to as "All"), and tests for significant differences between the values of the coefficient *b* for Females *vs* Males, Females *vs* All and Males *vs* All were performed.

Before submitting pairs (1; 2) of *b* values to a statistical test, it had to be established whether the variances of the y-estimates ($S_{(y)}^2$; see above) were statistically significant, i.e., whether

$$\frac{S_{(y1)}^2}{S_{(y2)}^2} > F_{(n_1-2;\, n_2-2;\, 0,10)} \qquad ...4)$$

When the differences in variance were not significant, the question whether the observed differences of the *b* values (b_1, b_2) were significant was investigated using the t-statistics

$$t = \frac{|b_1 - b_2|}{\sqrt{\frac{S_{(y1)}^2(n_1-2) + S_{(y2)}^2(n_2-2)}{n_1+n_2-4}\left[\frac{1}{\sum(x_1-\bar{x}_1)^2} + \frac{1}{\sum(x_2-\bar{x}_2)^2}\right]}} \qquad ...5)$$

When the variance was significantly different, the z-statistic was computed, which approximates t for sample size larger than 20 (Sachs 1978), and has the form

$$z = \frac{|b_1 - b_2|}{\sqrt{\frac{S_{(y1)}^2}{\sum X_1 - \bar{X}_1^2} + \frac{S_{(y2)}^2}{\sum X_2 - \bar{X}_2^2}}}$$

Results and Discussion

The results of the length-weight analysis are presented in Table 1 and Fig. 2. No significant differences were observed between the *b* values of any of the combinations Female *vs* Male, Female *vs* All and Male *vs* All. Thus, there are no sex-specific differences length-weight relationships in

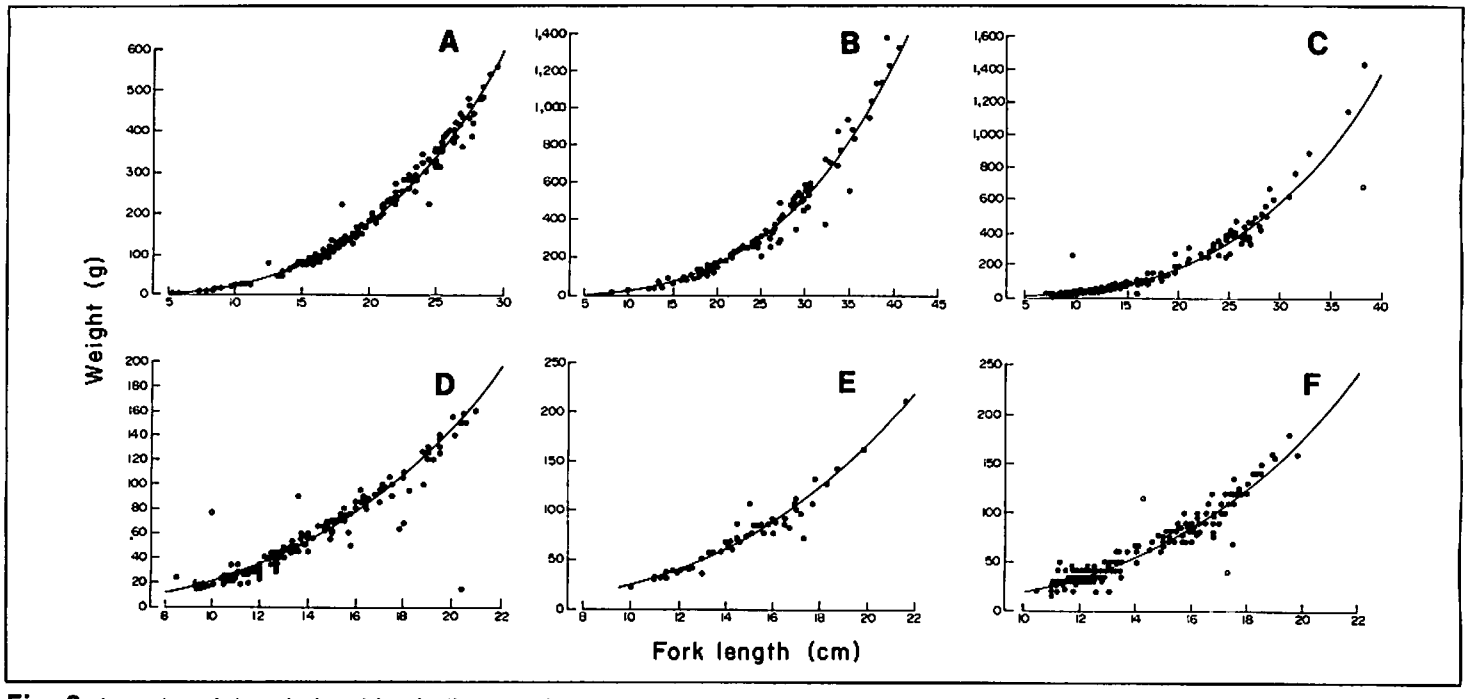

Fig. 2. ***Length-weight relationships in five species of West African sparids (open dots represent points not used).***

Table 1. Length-weight relationships and related statistics of five species of sparids caught during the *Guinea '90* trawling survey along the West African coast.

Species	Country	Sex	Length range (FL, cm)	*a*	*b*	r^2	n
Dentex angolensis	Liberia	F	9.7-29.5	0.0276	2.922	0.938	131
		M	16.0-29.0	0.0303	2.899	0.955	44
		All*	5.2-29.5	0.0268	2.934	0.992	206
Dentex canariensis	Ghana	F	14.8-35.0	0.0136	3.111	0.905	67
		M	16.4-40.4	0.0156	3.059	0.987	40
		All	8.5-40.4	0.0169	3.039	0.989	128
Pagrus caeruleostictus	Ghana	F	8.4-38.4	0.0216	3.013	0.844	82
		M	12.6-38.3	0.0252	2.946	0.896	41
		All	7.0-38.4	0.0304	2.897	0.974	218
Dentex congoensis	Liberia/ Ghana	F	9.4-20.0	0.0319	2.812	0.875	105
		M	8.5-21.0	0.0645	2.531	0.829	83
		All	8.5-21.0	0.0308	2.821	0.944	186
Pagellus bellottii	Liberia	F	10.0-19.8	0.0346	2.823	0.927	33
		M	11.0-21.6	0.0251	2.939	0.886	36
		All	10.0-21.6	0.0295	2.881	0.945	69
Pagellus bellottii	Côte d'Ivoire	F	11.0-19.8	0.0064	3.430	0.946	92
		M	10.5-19.5	0.0136	3.149	0.869	144
		All	10.5-19.8	0.0096	3.281	0.914	236

*"All" refers to females + males + unsexed juveniles

the five sparid species investigated here. Therefore, a single set of the coefficients *a* and *b*, derived from combined samples, would suffice to represent the length-weight relationships of each of these species.

Ramos and Fernandez (unpubl.) also used data from the *Guinea '90* cruise to derive length-weight relationships for the sparid species investigated in this paper. Their results, based on data not treated separately by countries as done here, but pooled for the entire region, differed only slightly from those obtained here.

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